Sampling and Analysis Plan

for the
DEFENSE TECHNOLOGY (DEFTECH) TEAR GAS SITE
Casper, Wyoming

Environmental Protection Agency
Emergency Response Program

START
EPA REGION VIII

Sampling and Analysis Plan
for the
Environmental Protection Agency Emergency Response Program

Project Name: Defense Technology (DefTech) Tear Gas

U.S. EPA Project Number: TDD No. 0105-0008

Contractor Project Number: TDD 75F0810508

U.S. EPA Contract Number: 68-W-00-118 EPA Region VIII

Prepared By: Henry Schmelzer

Approvals and Distribution:

Johanna Miller, EPA Project Officer — Date

Chuck Baker, START Deputy Program Manager — Date

Randy Perlis, START Project Manager — Date

cc: File/UOS
START2 QAO (Signature page only)

TABLE OF CONTENTS

1.0 LOCATION AND GEOGRAPHY OF SITE/FACILITY

Site/Facility Name: Defense Technology

Street Address: 9125 Neosho Road

City: Casper County: Natrona State: Wyoming Zip Code: 82601

Latitude:	Longitude:	Section:	Township:	Range:
42° 58' 48"	106° 21' 0"			

Approximate Area of Site: 40 Acres _____ Square Feet

General Topography: Flat, open, rural area

Nearest Residences are located within 500 feet (ft/mi) to the East

2.0 OWNER/OPERATOR OF SITE/FACILITY

Owner:	Operator:
Armour Holding Inc.	Defense Technology
Street Address:	Street Address: 1900 N Loop Ave.
City:	City: Casper
State: Zip Code:	State: WY Zip Code: 82601
Telephone:	Telephone: (307) 235-2136

Type of Ownership:

☐	Unknown	☐	State	☐	Municipality
☒	Private	☐	County	☐	Federal Agency
☐	_____				

3.0 NAME OF EPA AND/OR STATE AGENCY CONTACT

EPA Contact: Johanna Miller	City/County Contact: Bob Herrington
Street Address: 999 18th Street, 500	Street Address: 1200 E 3rd
City: Denver	City: Casper
State: CO Zip Code: 80202	State: WY Zip Code: 82601
Telephone: 303-312-6804	Telephone: 307-275-9340

4.0 HISTORY AND DESCRIPTION OF SITE/FACILITY

Years of Operation: At least since 1994 ☒ Unknown

Beginning year_____ Ending Year_____ Abandoned Since_____

Status of Site:

☐ Unknown ☒ Active ☐ Inactive ☐ NA (GW plume, etc.)

Predominant Land Uses Within One Mile of Site (Check all that apply):

☐	Unknown	☐	Recreational	☐	State/National Forest
☐	Industrial	☐	Mining	☐	State/National Park
☒	Commercial	☒	Agricultural	☐	_____
☒	Residential	☐	Logging	☐	_____

Site Setting: ☐Unknown ☐Urban ☐Suburban ☒Rural

Previous Investigations/Assessments/Permit Violations:

☐Unknown ☐No ☒Yes - Type Limited soil, interior wipe, and groundwater sampling

Distance to closest domestic or municipal well(s): 500 feet

Distance to closest surface water: Not Applicable

Distance to closest water intake(s): Not Applicable

Facility Type / Site Operations (Check all that apply):

☐	Unknown	☒	Chemical Manufacturing
☐	Private Residence/Neighborhood	☐	Petrochemical Manufacturing
☐	Dry Cleaning Facility	☐	Paint and Varnish Manufacturing
☐	Retail Gasoline Station	☐	Electronic Equipment Manufacturing
☐	Mining	☐	Agricultural Chemicals Manufacturing
☐	Metal Forging or Stamping	☐	Plastic and Rubber Products Manufacturing
☐	Metal Coating, Plating or Engraving	☐	Lumber and Wood Products Manufacturing
☐	Refinery	☐	Other Manufacturing
☐	Tannery	☐	Landfill
☐	Battery Reclamation	☐	Incinerator/Smelter
☐	Drum Recycling/Disposal	☐	Treatment, Storage, or Disposal
☐	Federal Facility	☐	Junk/Salvage Yard
☐	_____	☐	_____

The basis for the site information is: ☒ Site maps ☐ Geological information ☐ Disposal records ☒ Photos ☐ Historical data ☒ State investigation ☒ Federal investigation ☒ Personal interviews

5.0 LOCATION, CHARACTERISTICS AND EXTENT OF WASTE

Where is the waste located?: (Check all that apply)

☐	Unknown	☒	Vats	☒	Buildings
☐	Contaminated Soil	☒	Drums	☒	Storage Areas
☒	Contaminated Surface Water/Sediment (identified/unidentified source)	☐	Landfill	☒	Process Areas
		☐	Tailings Pile	☐	Laboratory
☐	Contaminated Groundwater Plume (identified/unidentified source)	☐	Surface Impoundment		
		☐	Trash Pile (open dump)		
☐	Wetlands	☐	Scrap Metal or Junk Pile		
☐	Storm Water Ponds	☐	Chemical Waste Pile		
☐	Wastewater Ponds	☐	Land Treatment Area		
☐	Lagoons	☐	Railroad Tracks		
☐	Drainage Ditches	☐	Roads / Access Ways		
☒	Tanks and Non-Drum Containers	☐	Injection Wells		
☐	Underground Tanks	☐	_____		
☐	_____	☐	_____		

What types of materials were handled at the site? (Check all that apply)

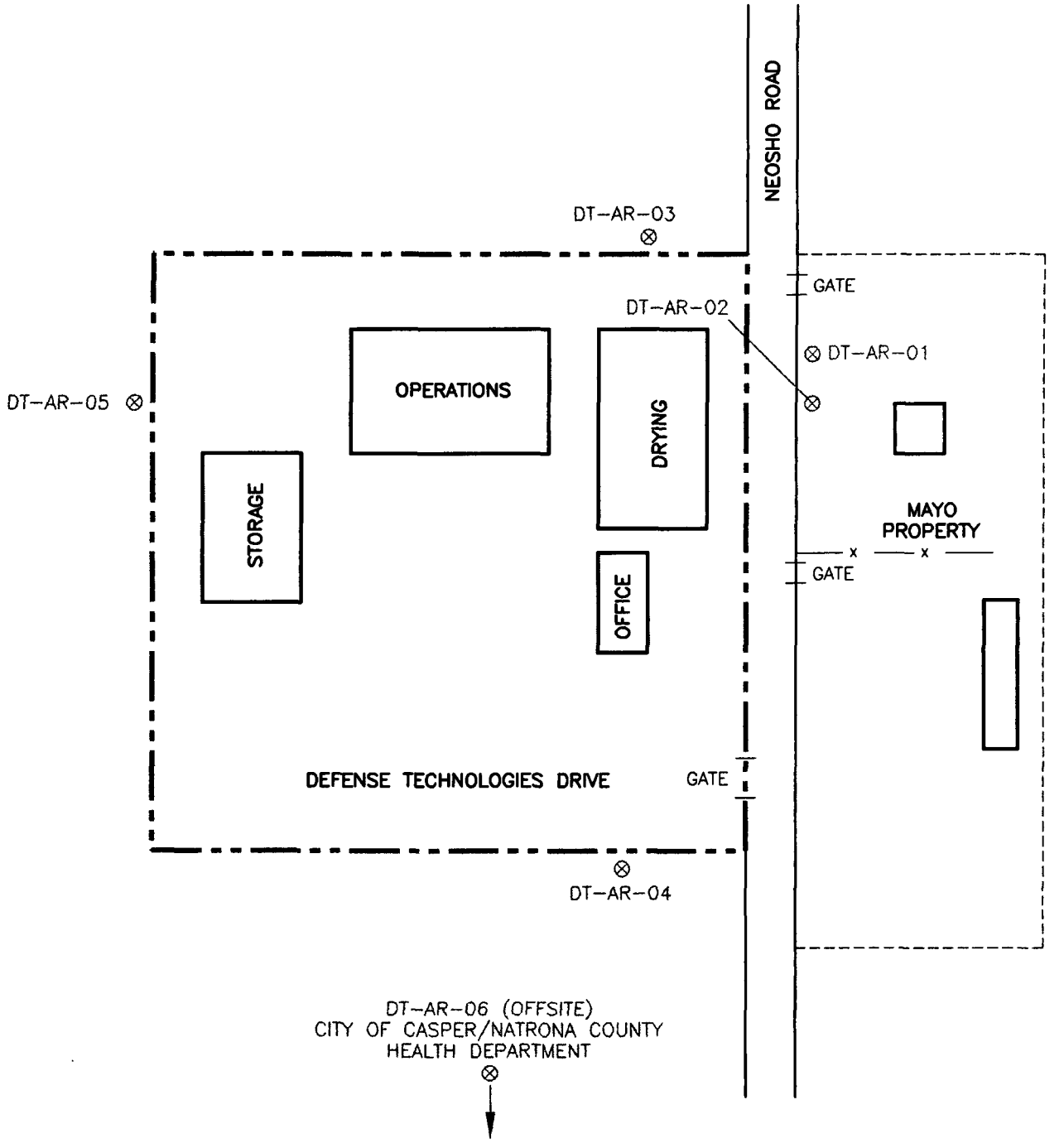
☐	Unknown	☒	Organics	☐	Laboratory/Hospital Waste
☒	Acids	☐	Pesticides/Herbicides	☐	Construction/Demolition Waste
☐	Bases	☐	Oily Waste	☐	Radioactive Waste
☒	Solvents	☐	Petroleum Products	☐	Mine Waste
☐	Inorganics	☐	Paint/Pigments	☐	Municipal Waste
☐	Metals	☒	Explosives	☐	_____

What is the physical state of the waste as deposited? (Check all that apply)

☒ Solid ☐ Sludge ☒ Powder ☐ Liquid ☐ Gas ☒ Aerosol

What are the contaminants of concern?

(Contaminants)	(Concentration Range)
CS Tear Gas	Unknown but suspected to be very low
2-chlorobenzaldehyde	Unknown but suspected to be very low
malononitrile	Unknown but suspected to be very low



NOT TO SCALE

LEGEND

DT-AR-## ⊗ PROPOSED AIR SAMPLE LOCATION

Sampling & Analysis Report
UOS Job No. 75-10508.00

Defense Technologies
Casper, Wyoming
Site Map
Figure 1

August 2001

URS OPERATING SERVICES

75-10508.00
P:\START2\Def Tech\Draft Air SAR

DATE: 08/07/01 KEN (TtEMI) FILENAME: H:/DRAWINGS/DEF TECH/SITEMAP.DWG

6.0 PROJECT OBJECTIVES

6.1 Project Stage

☒ Early Assessment ☐ _____
☐ Cleanup Attainment ☐ _____

6.2 Project Scope

What is the purpose of this sampling effort? Identify suspected contaminants in the breathing zone from fugitive emissions from the facility or from re-entrapment of contaminated soils.

What are the regulatory objectives (e.g., NPDES, Superfund)?

Superfund removal assessment

What are the action levels for contaminants of concern?
Detection of the contaminants.
Health based action levels for long term low level exposure to CS tear gas and its precursor materials have not yet been established other than for malononitrile. Sampling efforts will use detection levels as low as practical. The preliminary remediation goals (PRG) for malononitrile in ambient air is 0.073 micrograms per cubic meter ($\mu g/m^3$) and 18 milligrams per kilogram (mg/kg) in industrial soil. The PRG in residential soils is 1.2 mg/kg.

What work is involved? Collect air particulate and semivolatile samples from the fence line to identify off-site migration of airborne materials.

How will the planned activities resolve the problem? If compounds are detected, the sampling will establish that fugitive emissions from the facility are occurring on an ongoing basis or that contaminated soils are continuing to be re-entrained into the breathing zone.

Who are the intended users of the analytical data? Regulatory and public health agencies.

What will the sample analytical data be used for? To determine if there are on-going exposures to nearby residents

Who are the decision makers? U.S. Environmental Protection Agency (EPA), Wyoming Department of Environmental Quality (DEQ), City of Casper/Natrona County Department of Health

What are the project limitations (e.g., time, budget)? Budget may limit the number of samples

What are the sampling limitations (e.g., access, potential hazards)? Access to the site or adjacent properties, Unknown release times or conditions. Infrequent releases. Methodology revisions.

6.3	**Sampling Objective.** What are the sample collection objectives and the data types (S, S/D, D) that apply to this project? (Check all that apply, and note data type)	**Data Type***
	Emergency response	
☐	Assess health and safety for worker protection	
☒	Determine presence of contamination	D
☐	Determine general physical or chemical properties/sources	
☒	Quantify contamination and identify contaminants	D
☐	Compare to benchmark	
☐	Determine extent of contamination	
☐	Determine background	
☐	Identify hot spots	
☒	Identify sources	D
☒	Document observed release	D
☐	Delineate plume in groundwater	
☒	Identify migration pathways	D
☒	Identify transport mechanisms	D
☒	Determine threat to humans	D
☒	Determine threat to environment	D
☐	Determine treatment and disposal options	
☐	Verify cleanup	

*** Data Type:** The following notes summarize EPA Superfund data types. For a more complete description refer to Attachment 1.

S = Screening Data: Screening data are generated by rapid, less precise methods of analysis and less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data provide analyte identification and quantification, although the quantification may be relatively imprecise. Screening data without associated confirmation data are not considered to be data of known quality. (Refer to ERP Generic QAPP Section 5.1.1.)

S/D = Screening Data with 10% Definitive Confirmation: At least 10% of the screening data are confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data. As a minimum, at least three screening samples reported above the action level (if any) and three screening samples reported below the action level (or as non-detects) should be randomly selected from the appropriate group and confirmed. Analytical error determination is required unless total measurement error is determined during the confirmation analyses. (Refer to ERP Generic QAPP Section 5.1.2.)

D = Definitive Data: Definitive data are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined. (Refer to ERP Generic QAPP Section 5.1.3.)

7.0 SAMPLING DESIGN

The following sections summarize the sampling design. Match the number for the "Matrix Type" with the "Required Analyses," in Section 7.1 and with the "Sampling Approach" in Section 7.2.

Matrix Type:

Air	Water	Liquid Waste	Soil/Sediment/Solids
1 Ambient air	1 Domestic Wells	1 Petroleum Products	1 Soil
2 Emissions	2 Tap Water	2 Drum Liquid	2 Drum Solid
3 Soil gas	3 Groundwater	3 Tank Liquid	3 Tank Solid
4 _____	4 Surface Water	4 Waste Material	4 Waste Material
5 _____	5 _____	5 _____	5 Sediment

7.1 Analyses Required: Put the number for each matrix type (from the list above) next to the corresponding analysis required for that matrix.

Air	Water	Liquid Waste	Soil/Sediment/Solids
Example:	***Example:***	***Example:***	***Example:***
2, 3 Aromatic Amines	*2 BNA (semivolatiles)*	*3, 5 BNA (semivolatiles)*	*6 Ash Content*
__ 2,4-D & 2,4,5-T	__ BNA(semivolatiles, SVOC)	__ BNA(semivolatiles, SVOC)	__ Ash Content
__ Aromatic Amines	__ BOD	__ BOD	__ BNA(semivolatiles, SVOC)
__ Aromatic Hydrocarbons	__ COD	__ COD	__ BTU
__ Asbestos Fibers	__ Dioxins/Furans	__ Corrosivity	__ Dioxin/Furans
__ Bacteria	__ Haz Cat	__ Dioxins/Furans	__ Haz Cat
__ BP Hydrocarbons (36-126°C)	__ Herbicides	__ Haz Cat	__ Herbicides
__ Cyanides	__ Ignitability	__ Herbicides	__ Ignitability
__ Metals	__ Metals, dissolved	__ Ignitability	__ Metals
__ Fibers	__ Metals, total	__ Metals, dissolved	__ PAHs/PNAs
__ Formaldehyde	__ Oil and Grease	__ Metals, total	__ Pesticides, Chlorinated
__ Fungi	__ PAHs/PNAs	__ PAHs/PNAs	__ Pest., Organophosphorus
__ Inorganic Acids	__ Pesticides, Chlorinated	__ Pesticides, Chlorinated	__ PCBs
__ Mercury	__ Pest., Organophosphorus	__ Pest., Organophosphorus	__ TPH
__ Chlorinated Pesticides	__ PCBs	__ PCBs	__ TEPH (diesel range)
__ PAHs/PNAs	__ Solids, total	__ TPH	__ TVPH (gasoline range)
__ PCBs	__ TPH	__ TEPH (diesel range)	__ Phenols
__ PM_{10}	__ TEPH (diesel range)	__ TVPH (gasoline range)	__ Reactivity (CN & sulfide)
__ Total Nuisance Dust	__ TVPH (gasoline range)	__ Phenols	__ Solids, total
__ Vinyl Chloride	__ Phenols	__ Reactivity (CN & sulfide)	__ TCLP - Metals
__ VOC	__ Reactivity (CN & sulfide)	__ TOC	__ TCLP - Semivolatiles
1,2 CS tear gas	__ TOC	__ TOX	__ TCLP - Volatiles
1,2 2-Chlorobenzaldehyde___	__ TOX	__ VOC	__ TOC
1,2 malononitrile_____	__ VOC	__ TCLP - Metals	__ TOX
__ _____	__ pH	__ TCLP - Semivolatiles	__ VOC
__ _____	__ Immunoassay	__ TCLP - Volatiles	__ Immunoassay
	__ _____	__ Solids, total/dissolved	__ XRF
	__ _____	__ Immunoassay	
		__ XRF	

BOD = Biological Oxygen Demand
COD = Chemical Oxygen
CN = Cyanide
PAH/PNA = Polynuclear Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls
TCLP = Toxicity Characteristic Leaching Procedure
TPH = Total Petroleum Hydrocarbons
TEPH = Total Extractable Petroleum Hydrocarbons
TVPH = Total Volatile Petroleum Hydrocarbons
TOC = Total Organic Carbon
TOX = Total Organic Halides
XRF = X-ray Fluorescence
VOC= Volatile Organic Compounds

Matrix Type (copy from the previous page)

Air	Water	Liquid Waste	Soil/Sediment/Solids
1 Ambient air	1 Domestic Wells	1 Petroleum Products	1 Soil
2 Emissions	2 Tap Water	2 Drum Liquid	2 Drum Solid
3 Soil gas	3 Groundwater	3 Tank Liquid	3 Tank Solid
4 _____	4 Surface Water	4 Waste Material	4 Waste Material
5 _____	5 _____	5 _____	5 Sediment
6 _____	6 _____	6 _____	6 _____

7.2 Sampling Approach: Put the number for each matrix type (from the list above) next to the corresponding sampling approach for that matrix.

Air	Water	Liquid Waste	Soil/Sediment/Solids
Example:	***Example:***	***Example:***	***Example:***
1 Judgmental	***2 Judgmental***	***3, 5 Search (hot spots)***	***6 Composite***
	3 All GW wells		
_1_ Judgmental	__ Judgmental	__ Judgmental	__ Judgmental
__ Worst Case (Air Only)	__ Search (hot spots)	__ Search (hot spots)	__ Search (hot spots)
__ Search (hot spots)	__ Composite (explain below)	__ Composite (explain below)	__ Composite (explain below)
__ Composite (explain below)			
Samples will be composited as follows:	Samples will be composited as follows:	Samples will be composited as follows:	Samples will be composited as follows:

7.3 What is the justification for this sampling approach?

☐ Samples will be collected in four locations; North, South, East, and West of the facility drying room. A background location will also be established at the Natrona County Health Department.
☐ _____
☐ _____
☐ _____

8.0 SAMPLE COLLECTION AND ANALYSIS

The following sections summarize sample collection and analysis: Section 8.1 "Sampling Locations and Sample Quantity," Section 8.2 "Sampling Equipment," Section 8.3 "Sampling Equipment Fabrication," Section 8.4 "Equipment Decontamination," Section 8.5 "Support Vehicle/Facilities/Phones Required," Section 8.6 "Disposal of Investigation-Derived Waste," Section 8.7 Analytical Methods, Sample Containers, Sample Preservation, and Holding," and Section 8.8 Quality Assurance Objectives."

8.1 Sample Locations and Sample Quantity

Use Table 1 to identify the locations where you expect to collect samples and to indicate the number of samples you intend to collect at each location. Include background samples and designate which samples you will use for field and laboratory QC. **Complete one Table 1 for each Site Unit. Make extra copies of Table 1 if necessary.**

TABLE 1
Sample Locations and Sample Quantity
Defense Technology Tear Gas Site

	Analysis	Quality Control Samples							
		Lab QC			Field QC				
Sample ID / Location	CS, 2-chlorobenzaldehyde, malononitrile	**Standard Reference Samples**	**MS/MSD**	**Other...**	**Field Replicates**	**Trip Blanks**	**Field Blank**	**Equipment Rinsate**	**Total Samples**
DT-AR-01 Mayo Property (East)	X								1
DT-AR-02 Mayo Property (East)	X				DT-AR-01				1
DT-AR-03 North	X								1
DT-AR-04 South	X								1
DT-AR-05 West	X								1
DT-AR-06 Blank	X					X			1
DT-AR-07 Natrona Co. HD	X								1
	7				1	1			**Total Samples:** 7

8.2 Sampling Equipment

Put the number of the Matrix Type from Section 7.0 on the line next to the item of equipment.

Air	Water	Liquid Waste	Soil/Sediments/Solids
Example: f 3 Charcoal Tube	*Example: h 1,2 Sample Bottle*	*Example: g 2 Sample bottle* *h 2 COLIWASA*	a __ Auger
			b __ Backhoe
			c __ Bucket Auger
a __ 0.8 um Filter (MCE)	a __ Bacon Bomb	a __ Bacon Bomb	d __ Chisel
b __ 0.8-1.2 um, 25 mm Filter	b __ Bailer	b __ Bailer	e __ Eckman/Ponar Dredge
c __ 37 mm, 5 um PVC Filter	c __ Bladder Pump	c __ Peristaltic Pump	f __ Electric Hammer
d __ Bubbler	d __ Peristaltic Pump	d __ Dip Sampler	g __ Geoprobe Soil Core
e __ Charcoal Tube	e __ Dip Sampler	e __ Drum Thief	h __ Sampling Treir
f __ Filter and Impinger	f __ Drum Thief	f __ Kemmerer Bottle	i __ Scoop
g __ Florisil Tube	g __ Kemmerer Bottle	g __ Sample Bottle	j __ Shelby Tube
h 1 Glass Fiber Filter	h __ Sample Bottle	h __ COLIWASA	k __ Shovel
i __ Polyurethane Foam Filter	i __ COLIWASA	i __ _____	l __ Slam Bar Soil Core
j __ Silica Gel Tube	j __ Geoprobe	j __ _____	m __ Sludge Judge
k __ Solid Sorbent Tube	k __ Piezometer	k __ _____	n __ Soil Coring Device
l __ Summa Canister	l __ _____	l __ _____	o __ Spatula
m __ Tedlar Bag	m __ _____	m __ _____	p __ Split Spoon
n 1 Tenax Tube	n __ _____	n __ _____	q __ Thin-Wall Tube Sampler
o __ XAD-2 Tubes	o __ _____	o __ _____	r __ Trowel
p __	p __	p __	s __

8.3 Sampling Equipment Fabrication.

Put the letter associated with each type of equipment in 8.2 on the line next to the corresponding equipment fabrication and (circle) the sampling equipment that you must decontaminate.

Air	Water	Liquid Waste	Soil/Sediments/Solids
Example: e Charcoal Tube	*Example: h Glass* *h Plastic/PVC*	*Example: g (h Glass)*	*Example: i Plastic/PVC*
__ Fiberglass Filter			
__ Glass	__ Carbon steel/ Stainless steel	__ Carbon steel/ Stainless steel	__ Carbon steel/Stainless steel
__ Carbon steel/stainless steel	__ Teflon (PTFE)	__ Teflon (PTFE)	__ Teflon (PTFE)
__ Tenax Tube _____	__ Glass	__ Glass	__ Glass
__ _____	__ Plastic/PVC	__ Plastic/PVC	__ Plastic/PVC
__ _____	__ Plastic/polyethylene/HPDE	__ Plastic/polyethylene/HPDE	__ Plastic/polyethylene/HPDE
		__ _____	__ _____

8.4 Equipment Decontamination Steps (for non-dedicated equipment)

Put the letter associated with each type of equipment in Section 8.2 next to each applicable decontamination step.

Air	Water	Liquid Waste	Soil/Sediments/Solids
Example: *__ Physical removal*	*Example:* *__e Hexane rinse*	*Example:* *__ Physical removal*	*Example:* *__ Physical removal*
__ Physical removal	__ Physical removal	__ Physical removal	__ Physical removal
__ Non-phosphate detergent wash	__ Non-phosphate detergent wash	__ Non-phosphate detergent wash	__ Non-phosphate detergent wash
__ Potable water rinse	__ Potable water rinse	__ Potable water rinse	__ Potable water rinse
__ 10% nitric acid rinse	__ 10% nitric acid rinse	__ 10% nitric acid rinse	__ 10% nitric acid rinse
__ Hexane rinse	__ Hexane rinse	__ Hexane rinse	__ Hexane rinse
__ Methylene chloride rinse	__ Methylene chloride rinse	__ Methylene chloride rinse	__ Methylene chloride rinse
__ Pesticide grade acetone rinse	__ Pesticide grade acetone rinse	__ Pesticide grade acetone rinse	__ Pesticide grade acetone rinse
__ Distilled/deionized water rinse	__ Distilled/deionized water rinse	__ Distilled/deionized water rinse	__ Distilled/deionized water rinse
__ Organic free water rinse	__ Organic free water rinse	__ Organic free water rinse	__ Organic free water rinse
__ Air dry	__ Air dry	__ Air dry	__ Air dry
__ Cover with Plastic bag____	__ Cover with _____	__ Cover with _____	__ Cover with _____

8.5 Support Vehicles/Facilities/Phones:

What supporting equipment will be required and who is responsible for providing it (e.g., EPA, START)?

- ☐ Emergency Response Vehicle
- ☐ Trailer
- ☐ Geoprobe
- ☐ Drill Rig
- ☐
- ☐
- ☒ Cell Phone per each START2 member
- ☐ Global Positioning System (GPS)
- ☐
- ☐

8.6 Disposal of Investigation-Derived Wastes (IDW)

- ☒ No IDW will be generated.
- ☐ IDW will be containerized and characterized for appropriate disposal.
- ☐ IDW will be placed on site in an approved location.
- ☐
- ☐

8.7 Analytical Methods, Sample Containers, Sample Preservation, and Holding Times

Complete Table 2. Define the analytical methods you will use, the container types and the quantity of sample you need to collect at each sampling location, the appropriate preservation method for each analysis, and the sample holding times (based on the analysis and the matrix). For the air matrix, you should identify the sample flow rate rather than sample containers and the volume to be collected rather than the preservative. Refer to the START "Field Sampler's Guide" and the Eagle Pitcher "Environmental Sampling Guide" for help in completing this table.

TABLE 2
Analytical Methods, Sample Containers, Sample Preservation, Holding Times

Analysis	Analytical Method Number	Method Reference	Container Number and Type [1]	Required Volume	Preservation [2]	Technical Holding Time [3]
2-Chlorobenzaldehyde	AM-087	C/B FAC	7 glass fiber filter	480 L of air	Cool to 4°C	7 days
CS Tear Gas	8260	SW-846	7 Tenax Tube	480 L of air	Cool to 4 degrees C	7 days
Malononitrile	8260	SW-846	7 Tenax Tube	480 L of air	Cool to 4 degrees C	7 Days

1 Recommended container types: AGV = amber glass vial; HDPE = high-density polyethylene bottle and cap; AGB = amber glass bottle.

2 Preserve the samples as soon as you collect them. Add preservatives to filtered samples following filtration. Completely fill containers used for volatile organic samples, permitting no head space.

3 Technical holding time is the time interval from sample collection until sample analysis (or until sample extraction for semivolatile compounds). Technical holding times are determined by method and by matrix. Typical holding times are as follows:

	Water Matrix	Solid Matrix
Volatiles	14 days (preserved)	14 days
Semivolatiles	7 days	14 days
Pesticides/PCBs	7 days	14 days
Herbicides	7 days	14 days
Metals	6 months	6 months
Mercury	28 days	28 days
Cyanide	14 days (preserved)	14 days

8.8 Quality Assurance Objectives

Complete Table 3. Define the analytical detection limits that you require for this sampling event, list the analytical method references, the associated data type, and the project quality assurance objectives for precision and accuracy. The quality assurance parameters of comparability and representativeness are addressed in the Section 7.0 "Sampling Design."

Use the Data Quality Objectives (DQO) Process to ascertain the type, quality, and quantity of data necessary to address site-specific problems ("Guidance for the Data Quality Objectives Process, EPA QA/G-4," EPA 1994d). The Project Leader, supported by the EPA and the QAO, is responsible for implementing the DQO process as part of the project planning activities. In those cases in which the DQO process is not used, it is still necessary to state the project quality objectives and measurement performance criteria in the project-specific SAP. A START chemist can help you determine Quality Assurance objectives for analyses not included in the table below.

The following table lists reasonable ranges of accuracy (as % Recovery) and precision (as Relative Percent Difference) for the Removal Program:

Analysis	Water (% Recovery)	Soil (% Recovery)	Water (RPD)	Soil (RPD)
Metals	75-125	50-120	20	± 35%
Volatile Organic Compounds	75-125	60-140	15	± 25%
Semivolatile Organic Compounds	30-110	30-110	35	± 35%
Pesticides/PCBs	50-125	35-135	20	± 45%

TABLE 3
Quality Assurance Objectives

Analysis (for each matrix)	Analytical Method [1]	Data Type [3]	Units	Required Detection Limits [2]	Accuracy [4] % Recovery	Precision [4] ±%
2-chlorobenzaldehyde	8260	D	mg/m^3	0.0037 mg/m^3	90-110	10
CS Tear Gas	AM-087	D	mg/m^3	1 ng	90-110	10
malononitrile	8260	D	mg/m^3	1 ng	90-110	10

1 The specified analytical method contains the complete list of analytes determined from an analysis.
2 Detection limit, accuracy, and precision values are presented in this table as ranges. The values are based on method specifications and on project data quality objectives. Use a * to indicate site-specific DQOs that differ from method specifications.

3 Data type refers to the following:
S = Screening
S/D = Screening with 10% Definitive data
D = Definitive Confirmation

4 Accuracy is determined by use of field blind QC samples and laboratory matrix spikes. **Precision** is determined by use of field duplicates, laboratory duplicates, and laboratory matrix spike duplicates.

9.0 TECHNICAL STANDARD OPERATING PROCEDURES

Technical Standard Operating Procedures (TSOPs) are typically applicable procedures that may be varied or changed as required by site conditions or equipment limitations.

Indicate which applicable START Technical Standard Operating Procedures will be used for this project (check all that apply):

- ☒ TSOP 4.1 - General Field Operation - describes the overall field organization in support of sample collection, sample identification, record keeping, field measurements, and data collection.
- ☒ TSOP 4.2 - Sample Containers, Preservation and Maximum Holding Times - describes the methods used to place samples in appropriate containers to preserve specific samples, and the maximum time a sample can be held before it is analyzed.
- ☒ TSOP 4.3 - Chain of Custody - outlines the documentation necessary to trace sample possession.
- ☒ TSOP 4.4 - Sample Identification, Labeling, and Packaging - specifies the methods for sample identification and labeling. Sample packing and shipment methods are also outlined.
- ☒ TSOP 4.5 - Sample Location Documentation - outlines the methods for documentation of all sample locations.
- ☒ TSOP 4.6 - Use and Maintenance of Field Log Books - outlines the proper documentation of information in field log books during data collection activities.
- ☐ TSOP 4.7 - Hazardous Waste Characterization - outlines the methods for characterization of unknown materials for disposal, bulking, recycling, grouping and classification purposes.
- ☐ TSOP 4.8 - Investigation Derived Waste Management - outlines the management of wastes generated during environmental field operations.
- ☐ TSOP 4.9 - Monitor Well Installation - describes the methods for monitoring well installation, including design, construction procedures, and materials.
- ☐ TSOP 4.10 - Monitor Well Development - describes the methods for monitoring well development, including data recording formats.
- ☐ TSOP 4.11 - Equipment Decontamination - describes the techniques used to decontaminate equipment prior to sample collection or data measurement.
- ☐ TSOP 4.12 - Groundwater Sampling - establishes the methods for monitoring well purging, sample collection, and equipment use when sampling.
- ☐ TSOP 4.12A - Groundwater Sampling for Low Flow Purge - describes equipment and operations for sampling groundwater monitor wells using a pump to obtain samples with a minimum of turbidity.
- ☐ TSOP 4.13 - Water Level Measurement - describes the methods used to record water levels at surface water locations and in groundwater monitoring wells.

- ☐ TSOP 4.14 - Water Sample Field Measurements - describes the measurement techniques and data requirements associated with the collection of either a groundwater or surface water sample.
- ☐ TSOP 4.15 - Flow Measurements - describes the methods for conducting flow measurements during surface water sampling.
- ☐ TSOP 4.16 - Surface and Shallow Depth Soil Sampling - establishes the methods for sample collection using a variety of sampling devices. Techniques for avoiding sample and equipment cross-contamination are also discussed.
- ☐ TSOP 4.17 - Sediment Sampling - establishes the methods for sample collection using a variety of sampling devices. Techniques for avoiding sample and equipment cross-contamination are also discussed.
- ☐ TSOP 4.18 - Surface Water Sampling - establishes the methods for sample collection and equipment use at a variety of surface water locations. Techniques for avoiding water body and sample cross-contamination are also discussed.
- ☐ TSOP 4.19 - Soil Gas Sampling - outlines the methods for decontamination and soil gas sampling for routine field operations.
- ☐ TSOP 4.20 - Drum and Container Sampling - describes methods for safe and effective sampling of drums and containers less than 120 gallons.
- ☐ TSOP 4.21 - Tank Sampling - describes the measurement techniques used in sampling aboveground storage tanks.
- ☐ TSOP 4.22 - Aquifer Slug Testing - establishes the methods and data recording formats for conducting slug tests in groundwater monitoring wells.
- ☐ TSOP 4.23 - Aquifer Pump Testing - establishes the methods and data recording formats for conducting pump tests in groundwater extraction and monitoring wells.
- ☐ TSOP 4.24 - Geological Borehole Logging - describes the information and observations to be recorded for the identification, logging, and sampling of a borehole. Sampling methods and data collection formats are also presented.
- ☐ TSOP 4.25 - Residential Dust Sampling - describes the methods for collecting composite dust samples in a residential community.
- ☐ TSOP 4.26 - Chip, Wipe and Sweep Sampling - describes the equipment and methods required for obtaining a representative chip, wipe or sweep sample to monitor potential surface contamination.
- ☐ TSOP 4.27 - Basic Geoprobe® Operations - Model 4200 - provides general guidance for operating the Model 4200 Geoprobe® system for subsurface exploration.
- ☐ TSOP 4.28 - Fish Tissue Sampling - describes the methods for collecting fish tissue samples of the appropriate species, number, and size using electro fishing techniques or by angling.
- ☐ Draft Equipment SOP 1.6 - TW Spectrace 9000 FPXRF - describes the equipment and methods required for obtaining a representative metals analyses of selected materials.

10.0 SAMPLE DOCUMENTATION, HANDLING, AND SHIPMENT

TSOPS 4.2, 4.3, and 4.4 describe the procedures for sample documentation, handling, and shipment.

11.0 QUALITY ASSURANCE ASSESSMENTS

What QA Assessments will be applied to this project?

☒	Independent technical review	☐	Field surveillance
☒	Technical edit	☐	Field audit

☐ Readiness review (systematic, documented review of the readiness for the project start-up.)

☐ Management system review (evaluates the ability of project management to meet specified data and project DQOs).

☐ _____

The ERP Generic QAPP contains a complete description of these reviews (Section 12.0).

12.0 DATA VALIDATION

Will the analytical data be reviewed or validated?

☐ **QC Review** is a minimum requirement for all data collected.

☒ **Data Validation** is required for definitive data and for screening data with definitive confirmation (of the definitive data only).

☐ Other (explanation required): _____

13.0 REPORTS

What reports will be written for this project? (Check all that apply)

☒ Trip Report: Prepare a detailed report describing what occurred during each sampling activity within two weeks of the last day of each sampling activity. Include background, observations and activities, conclusions and recommendations (optional), and future activities. Provide information regarding major events, dates, and personnel on site (including affiliations).

☐ Status Report: Periodically (weekly/monthly/etc.) provide a detailed accounting of past and future sampling activities. Provide information on the time and date of major events and personnel on site (including affiliations). Include background, observations and activities, and future activities.

☒ Sampling Activities Report: Prepare a sampling activities report to document laboratory selection, analytical results, QA/QC, and comparison of results to DQOs.

☐ (Draft) Final Report: Correlate available background information with data generated during this sampling event. Include supportable conclusions that satisfy the project DQOs.

☒ Maps (specify size, if possible) 8.5 X 11 Sample locations
☐ Figures (titles/types) _____
☐ Drawings (scale) _____
☐ Field forms _____

14.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Personnel Information:

The EPA On-Scene Coordinators, Joyce Ackerman/Johanna Miller, will provide overall direction to the START staff concerning project objectives, sampling needs, and schedule.

The START2 Project Manager, Randy Perlis, is the primary point of contact with the EPA On-Scene Coordinator. The Project Manager is responsible for the development and completion of the Sampling QA/QC Plan, project team organization, and supervision of all project tasks.

The START2 Senior Chemist, Kent Alexander, is responsible for ensuring field adherence to the Sampling QA/QC Plan and recording any deviations. The Analytical Services Coordinator is the primary contact with the analytical laboratory.

The following personnel will also work on this project:

Name	Responsibility
Henry Schmelzer	Air Sampling Team Leader
Paul Schnitz	Sampler

For a detailed description of personnel responsibilities, refer to Section 2.0 of the ERP generic QAPP.

15.0 SCHEDULE OF ACTIVITIES

Proposed Schedule of Work:

Activity	Start Date	End Date
Mobilization to Site	Day 1	Day 1
Collect air samples	Day 2	Day 2
Collect air samples	Day 3	Day 3
Collect air samples	Day 4	Day 4
Collect air samples	Day 5	Day 5
De-mobilize from the site	Day 6	Day 6

NOTES

Air sampling will consist of collection of the contaminants on 1-micron glass fiber filters and in Tenax tubes using battery powered personal air sampling pumps drawing one liter of air per minute. The air sampling pumps will be calibrated to operate at this flow rate and will be checked at the beginning and end of each sample period to document the actual flow rate. The ERT SOP for air sampling will be used.

Due to DefTech operating on a four-day work week and the local residents reporting the releases during these times, the sample collection period will last 12 hours and be conducted to occur during these times. Sampling from 0800 to 2000 hours is suggested and may vary due to the actual working hours for DefTech. The sampling method calls for a total volume of 480 liters to be collected in eight hours. Increasing this volume to 720 liters and increasing collection time to 12 hours will lower the detection level and help ensure that any fugitive emissions will be identified.

The personal sampling pumps are set up to work for a typical 8-hour work day. Due to the extended period of time to collect these samples, they will be operated either on their charger using power supplied from the residences, or by replacement with a new fully charged battery pack after eight hours of sampling.

Sample locations will be set up along the perimeter of the DefTech property with focus on the drying facility where it is most likely releases may be originating. Since the Mayos live directly across Neosho Road to the east from the facility, a sampling location will be established there. In addition, since this location will be in the most likely downwind spot a second sampler will be collocated here to provide a replicate sample for quality control purposes. Other sampling locations will be set up directly North, South, and West of the drying facility to collect any contaminant that may be redirected by changes in wind direction.

An on-site meteorologic station can be set up to collect information on wind speed and direction, air temperature, and barometric pressure, or this information can be provided from data collected from the Casper Airport located approximately 10 miles to the southwest of the facility. Due to relatively flat terrain it is unlikely that there would be significant differences in these parameters used to correct to standard temperature and pressure conditions during the sample times.

To increase the likelihood that a fugitive emission event is captured during the sampling period it is suggested that the sampling be conducted during each day of the four-day work week.

Upon completion of the sampling period, the collection media will be shipped under chain of custody to a qualified laboratory where the samples will be analyzed for CS tear gas and its precursors, 2-chlorobenzaldehyde and malononitrile. The concentrations will be reported as milligrams per filter and, when combined with the calculated sample air volume, will result in an average exposure rate reported as milligrams per standard cubic meter. The detection level reported for this method with a total of 480 Liters of air collected is 0.0037 mg/m^3 for the CS tear gas.

ATTACHMENT 1
Superfund Data Categories
(continued)

QA/QC Levels[1]	Screening	Screening with 10% Definitive Confirmation	Definitive
Data Uses[1]	Data useful only for immediate situation; and to afford a quick, preliminary assessment of site contamination.	Data useful for site assessment and decision making at OSC discretion	Data useful for enforcement, litigation, risk assessment, and most other uses
Typical Uses	• Preliminary health and safety assessment • Preliminary identification and quantification of pollutants • Non-critical decisions • Emergency situations • Waste profiling	• Site characterization • Waste characterization • Clean-up confirmation • Verification of health and safety assessment • Verification of critical samples	• Enforcement • Litigation • Risk assessment
Quality Assurance Type	Data of Unknown Quality	Data of known quality	Data of known quality
Quality Assurance Elements	• Logged quality control checks • Qualified analyst	• Identification • Quantification • Confirmation of 10% of the samples by a definitive method • Error determination[2]	• Definitive identification • Definitive quantification • Error determination
Validation	None	QC Review[3]	Validation of 10% of the results in each of the samples, calibrations, and QC analyses
Quality Control Elements	• Instrument QC • Field QC • Analyst training • Document DLs (Field blanks and collocated samples are not required)	• Instrument QC • Field QC • Analyst training • QC within method parameters • Document DLs	• Instrument QC • Field QC • Analyst training • QC within method parameters • Document DLs
Sampling Plan	Optional	Mandatory	Mandatory

[1]QA/QC levels: Screening is equivalent to QA1; Screening with Definitive Confirmation is similar to QA2 (see footnote 2), and Definitive is similar to QA3. The difference between Definitive and QA3 is found in determination of error, where QA3 requires collection and analysis of eight replicate samples, and Definitive requires analysis of an appropriate number of replicate or collocated samples.

[2]Error determination: Screening with Definitive Confirmation requires measurement of analytical error (screening sample replicates) unless total measurement error (collocated samples) is determined during the confirmation analyses. Error determination is optional for QA2. The site-specific SAP may state that error determination is not necessary if it can be qualitatively shown that the DQOs do not require it, e.g., concentrations in the percent range are expected to be found, yet the action level is in the ppb range.

[3]QC review is required for all samples analyzed under Screening with 10% Definitive Confirmation. Data validation is required for the Definitive Confirmation data.

ATTACHMENT 1
Superfund Data Categories

QA/QC Levels[1]	Screening	Screening with 10% Definitive Confirmation	Definitive
Typical Volatile Analyses	• Field GC (e.g., Sentex field GC with single column and detector)	• Field GC with 10% of samples being confirmed by GC/MS with full QA/QC deliverables; duplicates and blanks.	• EPA Method 8240 or 8260; data package; replicates; blanks and spikes
Typical Volatile Analyses (continued)	• Field GC (continued)	• GC method with 10% of samples being confirmed by GC/MS with full QA/QC deliverables; duplicates and blanks.	• EPA Method 8010/ 8020 with second column confirmation; data package replicate, blanks, and spikes.
Typical Non-volatile Analyses	• Immunoassay kits	• Immunoassay with 10% of samples being confirmed by GC/MS with full QA/QC deliverables; duplicates and blanks.	• EPA Method 8270; data package; replicates, blanks, and spikes.
		• GC method with 10% of samples being confirmed by GC/MS with full QA/QC deliverables; duplicates and blanks.	• EPA Method 8100/ 8120 with second column confirmation; data package; replicate, blanks, and spikes.
Typical Metal Analyses	• Field XRF	• Field XRF with 10% of samples being confirmed by ICP or AA with full QA/QC deliverables; duplicates and blanks.	• EPA Method 6010; data package; replicates, blanks, and spikes.
		• AA, ICP, IC, or wet chemistry methods with 10% of samples being confirmed by ICP or AA with full QA/QC deliverables; duplicates and blanks.	• EPA methods for AA (7000s); data package; replicate, blanks, and spikes.

ATTACHMENT 1
Superfund Data Categories
(continued)

QA/QC Levels[1]	Screening	Screening with 10% Definitive Confirmation	Definitive
Typical PCB/ Pesticide Analyses	• Immunoassay Kits	• Immunoassay kits[4] with 10% of samples being confirmed by GC/MS with full QA/QC deliverables; duplicates and blanks.	• EPA Method 8140-Pesticides; data package; replicates, blanks, and spikes.
		• GC method with 10% of samples being confirmed by GC on a second column with full QA/QC deliverables; duplicates and blanks.	• EPA Method 8080 with second column confirmation; data package; replicate, blanks, and spikes.
Typical Petroleum Hydrocarbon Analyses	• Immunoassay kits • Chem test kits (HANBY) • IR (EPA 413 and 418) methods	• Immunoassay[4], IR, and chemical analysis with 10% of samples being confirmed by GC/MS or EPA Method 8015 (modified) with second column confirmation with full QA/QC deliverables; duplicates and blanks.	• EPA Method 8015 (modified) with second column confirmation; data package; replicate, blanks, and spikes.
		• GC method with 10% of samples being confirmed by GC/MS or GC on two columns with full QA/QC deliverables; duplicates and blanks.	
Testing for physical parameters is not analyte specific. Therefore, by strict definition, any physical test would have to be considered non-definitive. However, the testing methods may be definitive if approved methodology is followed.			
Physical Parameters (pH, flash point, etc.)	• Field testing equipment	• Testing equipment with QC samples, duplicates, and blanks.	• Testing equipment; data package; and QC samples, duplicates, and blanks.

[4]Immunoassay kits used to generate data must be capable of generating calibration, blank, duplicate, and estimation of error data.